XIII. Lyle Baker, Oregon Forest Nursery. Subject: Shading and Irrigating.

1. Discussion followed with reports of other nurserymen as to their own experience with shading and irrigating problems and how they solved them.

2. Mr. Lamb asked if anyone had any information as to the effect of shading and how it benefits growth. Mr. Baker answered that actual shading by cutting down the period of time cuts down on response.

3. Mr. Fisher mentioned a project under way 35 miles west of Boise. Here 12 different types of vegetables are being tested under various quantities of light. Their results may or may not be transferable.

4. Discussion followed on effects of photosynthesis.

SHADING AND IRRIGATING

by
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Shading and irrigating in forest nurseries are two important phases of operation that have been with us for many years. And actually we don't have all the answers yet, or ever will have, because each time a new nursery site is developed, new problems arise. There are some basic rules we can use as a starting point, but shading and irrigating standards must be determined for each nursery after years of experience.

It has long been a recognized fact that a number of the coniferous species do better in the nursery beds if covered with some type of partial shade. Over 60 years ago, Filbert Roth mentioned the use of shade frames in his book entitled "The First Book of Forestry."

Several methods have been used to shade the seedbeds. These may be summarized briefly as: (1) natural material, such as branches of trees or shrubs placed over the seedbeds; (2) fabricated materials, such as snow fence, burlap, camouflage netting;and (3) synthetics and plastics, such as Lunite saran shade cloth.

The use of natural materials to shade seedbeds is very seldom, if ever, used anymore in the nurseries. The most efficient method of providing shade is to use the slat-wire snow fence supported on two strands of wire about 40" apart. This wire is stretched from one end of the bed to the other and is supported on stakes and cross strips placed at 12' intervals. Shades handmade from lath and 1" x 4" material can also be placed on the wire support.

Another method of supporting the rolls of snow fence or handmade shades is to run wooden stringers of 1" x 2" or 1" x 4" material between stakes placed at 4' to 6' intervals on each side of the bed.

A third method of providing shade for the seedlings is the use of synthetic or plastic material. These materials are usually woven together in such a way as to provide various percentages of shade. They can be purchased in rolls of the desired width and can be rolled out on the wire or wooden supports.

The Horace B. Greeley Nursery at Nisqually, Washington uses still another method to provide shade for beds of Hemlock seedlings primarily. Wooden supports are built high enough over the seedbed area that a man can work under them and the seedlings can be watered without removing the shade. Over these wooden supports is placed some Saran shade cloth. So far as I know, this type of shading works very well.

Practically all of my experience in shading seedbeds has been with the use of the slat-wire snow fence or the handmade type of shade frames. Experiments carried out at the Hugo Sauer Nursery in Wisconsin some years ago showed that the height of the shade frame above the seedbed had a very definite effect on the density of seedlings that survived. Shade placed at the right height over a seedbed may actually increase the stand where shade placed too close to the seedbed will decrease the density because of stagnation and heating of the air.

We have found that the slat•wire snow fence or the handmade type of lath shade, which provides about 50% shade, placed at 8" or 12" above the seedbeds gives us very good results. The frames can be placed as low as 8" from the seedbed for the slower growing species, such as the spruces. For other species requiring shading, such as the true firs, we place the shade 12" above the seedbeds.

Unpublished data given to me by Dr. Ernest Wright of the Oregon State Forest Research Laboratory indicates that some species, such as the pines, do not benefit from shade; while other species, such as the Sitka spruce, depend almost entirely on some form of shade for survival, especially for the first year. Dr. Wright's experiments indicate that half-shade (56%) gives the best survival and growth on those species requiring shade.

Another thing we should keep in mind when we talk about shading seedbeds is that the amount of light is not the only factor involved that affects the seedling. We must take into consideration two other factors that affect the seedlings. These are moisture and temperature. Moisture is retained near the soil surface for a longer period of tine when shade is used. The temperatures are also reduced under the shade. Consequently, the coniferous species requiring shade are also benefitted by additional moisture and lower temperatures.

In a small nursery the advantages of using shade on seedbeds requiring it generally outweigh the disadvantages. However, in a large nursery, such as ours, the reverse is generally true. At the present tine we are planting between 23 and 25 acres of seedbeds annually. About 900 of this acreage is in species, such as Douglas fir, Sitka spruce, Norway spruce and the true firs, which could be shaded to achieve the best results. We have shaded only the Sitka spruce because it is the most critical. One can readily see the tremendous amount of materials and labor that would be needed to cover this large an area, especially if the shades had to be moved several times a year for weeding, spraying, etc. Consequently, we are doing the same thing at Elkton that most nurseries are doing today and that is to revert to the use of water as a substitute for shading the seedbeds. By keeping the seedbeds cooled with water during the critical periods in the early stages of seedling growth, we achieve some measure of success in producing a crop of seedlings.

This brings me to the second part of this presentation, or a discussion on irrigating. Here again I must reiterate that the irrigation problems must be worked out for each nursery. The nursery may be located in an area where the soil is a sandy loam, or it may be located in an area where the soil is a heavy clay. The nursery may be located at a low elevation, or a high elevation; in an area of low annual rainfall, or an area of heavy annual rainfall; in an area that receives many summer days of high temperatures, or in an area that has cooler temperatures. All these factors will affect the amount of irrigating that must be done.

However, there are still some general rules that we can follow. Every type of soil has a maximum water--holding capacity. Enough water should be applied to bring the moisture content in the surface 8" up to field capacity.

The most critical period in the growth of a coniferous seedling is during germination and for 6 to 8 weeks thereafter. During this period it is necessary to keep the surface of the soil moist by daily watering unless it rains, or unless very little evaporation takes place because of cloudy or cool weather. During June, July and August when there may be periods of extreme heat, it may be necessary to water twice or more times a day, not only to keep moisture up to the surface, but also to keep the surface temperatures down.

No hard and fast rules can be prescribed as to the frequency of irrigating in a nursery. In addition to the factors mentioned earlier, such as annual rainfall, temperatures, elevation and soil type, the frequency of irrigation will also depend upon the species being grown and its stage of development. Once the seedlings are past the succulent stage, one or two waterings a week are usually adequate to maintain the soil moisture.

During the latter part of each growing season, September and October in our area, the waterings should be curtailed to allow the seedlings to harden off or develop dormancy. Seedlings that have stopped top and root growth by the time of the first fall frosts will be able to go through the winter months without loss or damage.

SUMMARY

1. Each nursery has its own particular problems in shading and irrigating which have to be solved by actual experience.

2. The most efficient method of providing shade is to use slat-wire snow fence, or handmade lath shades supported on wires stretched, the length of the seedbed and placed on wooden stakes and cross strips placed at 12' intervals and raised the desired height above the ground.

3. Shades placed either 8" or 12" above the seedbeds, depending upon the species, and providing approximately 50% shade, give the best results.

4. Several factors that affect seedlings are involved when shade is provided. In addition to shade, these factors are moisture and temperature.

5. In a large nursery, the disadvantages of providing shade generally outweigh the advantages.

6. The first 6 to 8 weeks in the germination and growth of the seedling are the most critical. During this period daily irrigation is most important, especially if daily temperatures are high.

7. Factors affecting the frequency of irrigation are annual rainfall, temperatures, elevation, soil type, species being grown and its stage of development.

8. Number of waterings should be curtailed during latter part of growing season to allow seedlings to harden off.